SPECIFICATION

FOR

APPROVAL

(◆) Preliminary Specification

( ) Final Specification

Title	18.1” SXGA TFT LCD

BUYER	GENERAL
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LM181E1
SUFFIX	J3MN

***When you obtain standard approval,**
please use the above model name without suffix.

SIGNATURE	DATE
/	
/	
/	

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	DATE
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RECORDS OF REVISIONS

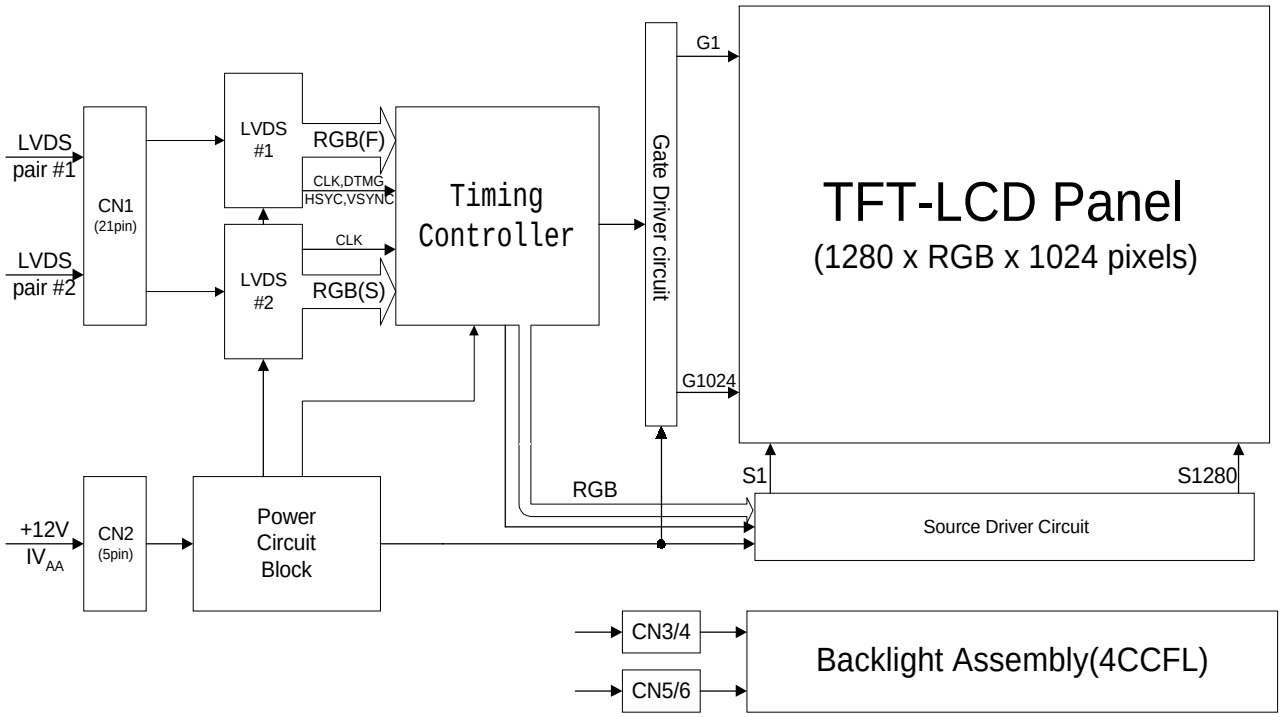
Version No	Date	Page	DESCRIPTION
0.1	July 28, 2000	-	Preliminary
0.2	Sept 08, 2000	p13	Changed the Gamma value : 2.1 → 2.7
		p14	Changed the Gray scale
		p18	Update the ESD Test conditions
0.3	Sept 18, 2000	p12	Changed the power sequences
			☞ T_2 Min : - → 0.01ms
			☞ T_4 Min : 100ms → 0.01ms
			☞ T_6 Min : 50ms → 0.01ms
		p13	Added the Cross talk
		p14	Update the Gray scale
0.4	Oct 31, 2000	p6	Changed the established starting voltage at 0℃
			☞ 1550 → 1500

1. General Description

The LM181E1-J3MN is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) back light system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. This TFT-LCD has a 18.1 inch diagonally measured active display area with SXGA resolution(1024 vertical by 1280 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus, presenting a palette of more than 16,777,216 colors.

The LM181E1-J3MN has been designed to apply the interface method that enables low power, high speed low EMI. FPD Link must be used as a LVDS(Low Voltage Differential Signaling) chip.

The LM181E1-J3MN is intended to support applications where thin thickness, wide viewing angle, low power are critical factors and graphic displays are important. In combination with the vertical arrangement of the sub-pixels, the LM181E1-J3MN characteristics provide an excellent flat panel display for office automation products such as monitors.



General Features

The following are general feature of the model LM181E1-J3MN LCD;

Active screen size	18.1 inches(45.97cm) diagonal
Outline dimensions	412.5(H) × 333.0(V) × 22.5(D) mm (Typ.)
Pixel pitch	0.2805 mm × 0.2805 mm
Pixel format	1280 horiz. By 1024 vert. pixels RGB stripe arrangement
Color depth	8-bit, 16,777,216 colors
Luminance,White	200 cd/m^2 (Typ.)
Power Consumption	Total 29.16Watt,Typ.(6.6Watt @IV$_{AA}$,22.56Watt@200cd/m^2 [Lamp])
Weight	2835g (Max.)
Display operating mode	Transmissive mode, normally black
Surface treatments	Hard coating(3H), Anti-glare treatment of the front polarizer

2. Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	symbol	Values		Units	Notes
		Min.	Max.		
Power Input Voltage	IV_{AA}	-0.3	+13.2	V(DC)	at 25℃
Operating Temperature	T_{OP}	0	+50	℃	1,2
		0	+50	℃	3
		0	+60	℃	4
Storage Temperature	T_{ST}	-20	+60	℃	1,2

Note: 1. Temperature at 5mm above display center of LCD Module.
Ta ≤ 40℃ : 95%RH Max
Ta > 40℃ : Absolute Humidity shall be less than Ta = 40℃ 95%RH .
These shall be no dew condensation.
2. Humidity Min. 5%RH, Max. 95%RH
3. Measured at the glass surface of LCD Module
4. Measured at the other surface of LCD Module

3. Electrical Specifications

3-1. Electrical Characteristics

The LM181E1-J3MN requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The other input which powers the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
MODULE:						
Power Supply Input Voltage	IV_{AA}	11.2	12.0	12.6	V(DC)	
Power Supply Input Current	I_{CC}	-	0.55	0.9	A	1
Power Consumption	P_C	-	6.6	10.8	Watts	1
LAMP						
Operating Voltage	V_{BL}	690(9mA)	705(8mA)	940(3mA)	V_{RMS}	2
Operating Current	I_{BL}	3.0	8.0	9.0	mA	
Established Starting Voltage at 25℃		-		1250	V_{RMS}	3
Established Starting Voltage at 0℃		-	-	1500	V_{RMS}	
Operating Frequency	f_{BL}	30	60	80	kHz	4
Discharge Stabilization Time	T_S	-	-	3	Minutes	6
Power Consumption(4CCFL's)	P_{BL}	-	22.56	-	Watts	5
Life Time		20,000	30,000	-	Hrs	7

Note)The design of the inverter must have specifications for the lamp in LCD Assembly.

The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC Inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter(no lighting, flicker, etc) never occurs. When you confirm it, the LCD Assembly should be operated in the same condition as installed in your instrument**.**

Notes:1. The current draw and power consumption specified is for 12.0 Vdc at 25℃and fv at 60Hz. (at 8-gray pattern displayed)

2. The variance of the voltage is ± 10%.
3. The output voltage at the transformer in the inverter must be high considering to the loss of the ballast capacitor in the inverter.
4. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interference with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away as possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
5. The lamp power consumption shown above does not include loss of external inverter.
6. Let's define the brightness of the lamp after being lighted for 5 minutes as 100%. T_s is the time required for the brightness of the center of the lamp to be not less than 95%.
7. The life time is determined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2℃.

3-2. Interface Connections

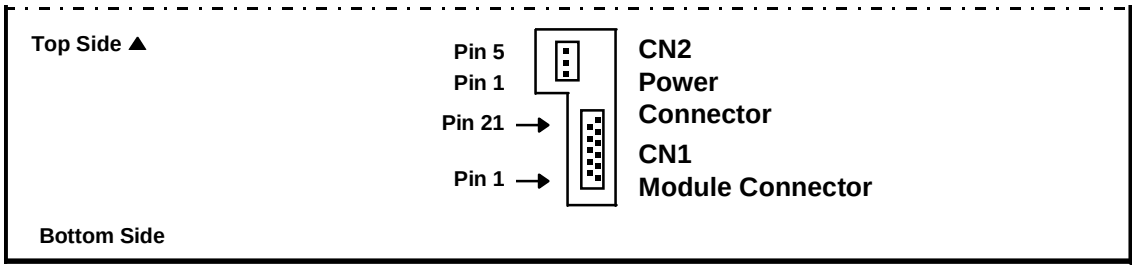
Interface chip must be used LVDS, part No. DS90CF383MTD(Transmitter), DS90CF384MTD(Receiver) made by National Semiconductor. Or used the compatible interface chips(TI : SN75LVDS83, Thine).

This LCD employs six interface connections. A 21-pin connector is used for the module electronics interface. A 5-pin connector is used for the module power(+12V). Four 2-pin connectors are used for the integral backlight system.

The electronics interface connector is a model GT121-21P-TD manufactured by LGC. The pin configuration for the connector is shown in the table 3.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (LVDS)

Pin	Symbol	Description	Notes
1	FR3P	Plus Signal of Odd Channel 3 (LVDS)	First Data
2	FR3M	Minus Signal of Odd Channel 3 (LVDS)	
3	FCLKINP	Plus Signal of Odd Clock Channel (LVDS)	
4	FCLKINM	Minus Signal of Odd Clock Channel (LVDS)	
5	FR2P	Plus Signal of Odd Channel 2 (LVDS)	
6	FR2M	Minus Signal of Odd Channel 2 (LVDS)	
7	FR1P	Plus Signal of Odd Channel 1 (LVDS)	
8	FR1M	Minus Signal of Odd Channel 1 (LVDS)	
9	FR0P	Plus Signal of Odd Channel 0 (LVDS)	
10	FR0M	Minus Signal of Odd Channel 0 (LVDS)	
11	SR3P	Plus Signal of Even Channel 3 (LVDS)	Second Data
12	SR3M	Minus Signal of Even Channel 3 (LVDS)	
13	SCLKINP	Plus Signal of Even Clock Channel (LVDS)	
14	SCLKINM	Minus Signal of Even Clock Channel (LVDS)	
15	SR2P	Plus Signal of Even Channel 2 (LVDS)	
16	SR2M	Minus Signal of Even Channel 2 (LVDS)	
17	SR1P	Plus Signal of Even Channel 1 (LVDS)	
18	SR1M	Minus Signal of Even Channel 1 (LVDS)	
19	SR0P	Plus Signal of Even Channel 0 (LVDS)	
20	SR0M	Minus Signal of Even Channel 0 (LVDS)	
21	NC	Not Connect	



Back side of LCD Module

The module power connector is a model B5B-ZR-SM3-TF manufactured by JST. The pin configuration for the connector is shown in the table 4.

Table 4. POWER CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Notes
1	GND	Ground	1
2	GND	Ground	
3	GND	Ground	
4	IV_{AA}	Supply voltage for LCD module	2
5	IV_{AA}	Supply voltage for LCD module	

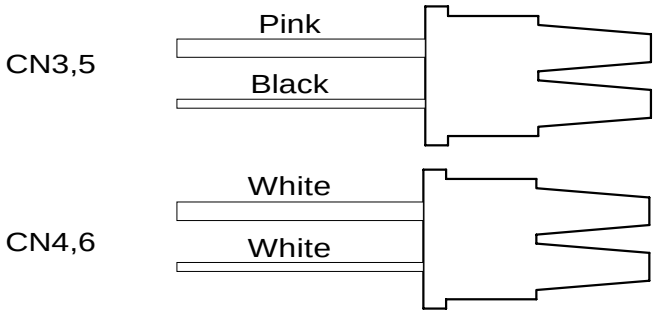
Notes: 1. All GND(ground) pins should be connected together and should also be connected to the LCD's metal frame.
2. All IV_{AA}(power input) pins should be connected together.

The backlight interface connector is a model BHSR-02VS-1, manufactured by JST. The mating connector part number is SM02B-BHS-1 or equivalent. The pin configuration for the connector is shown in the table 5.

Table 5. BACKLIGHT CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Notes
1	HV	Lamp power input	1
2	LV	Ground	2

Notes: 1. The input power terminal is colored pink or white. Ground pin color is white or black.
2. The lamp ground should be common with GND.



3-3. Signal Timing Specification

This is the signal timing required at the input of the LVDS Transmitter. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

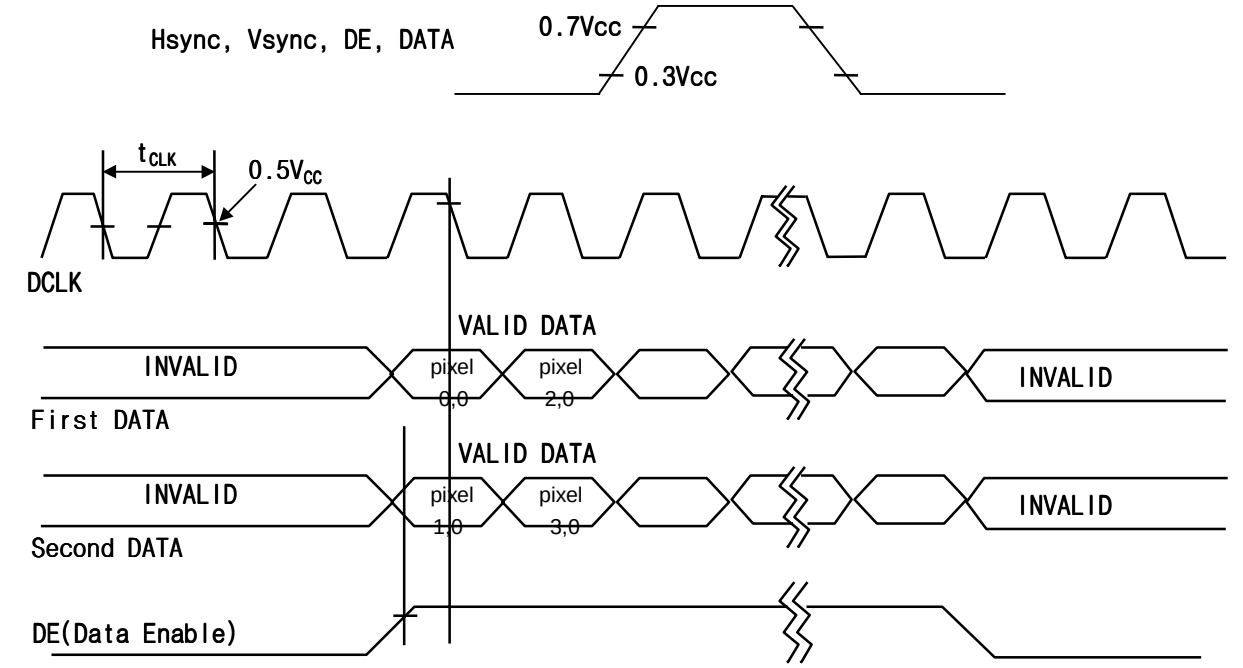
Table 6. Timing Table

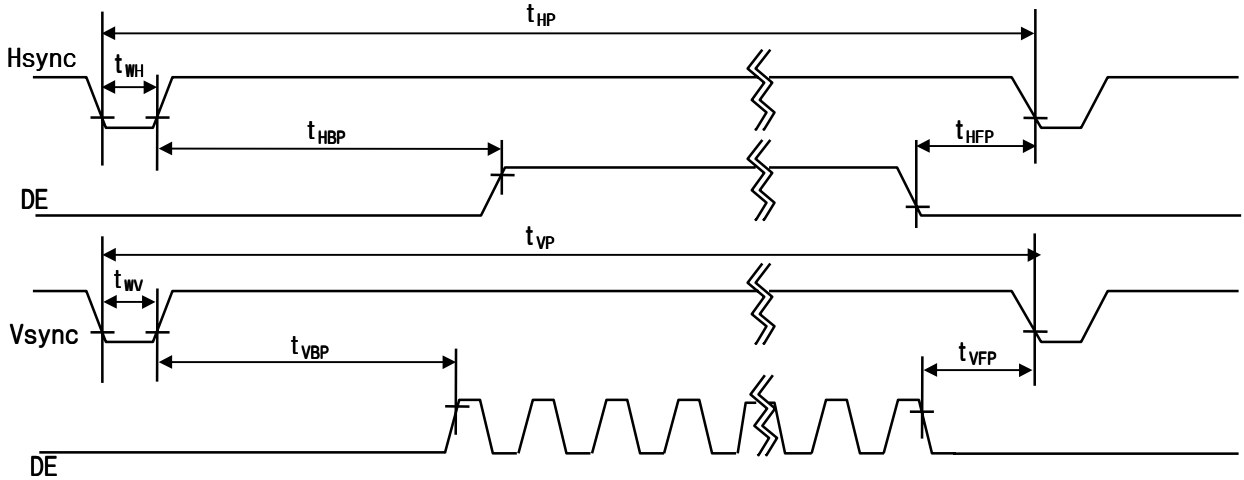
ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Dclk	Period	t_{CLK}	18.52	18.52	18.52	ns	1
Hsync	Period	t_{HP}	760	844	928	t_{CLK}	
	Width-Active	t_{WH}	8	56	240		
Vsync	Period	t_{VP}	16.67	16.67	16.67	ms	
	Period	t_{VP}	1032	1066	1097	t_{HP}	
	Width-Active	t_{WV}	2	3	24		
DE (Data Enable)	Horizontal Back Porch	t_{HBP}	12	124	-	t_{CLK}	
	Horizontal Active	-	-	640	-		
	Horizontal Front Porch	t_{HFP}	8	24	-		
	Vertical Back Porch	t_{VBP}	1	38	-	t_{HP}	
	Vertical Active	-	-	1024	-		
	Vertical Front Porch	t_{VFP}	1	-	-		

Note 1. Two pixel data are sampled at the same time.

Pixel 0,0	pixel 1,0	pixel 2,0	pixel 3,0				pixel 1278,0	pixel 1279,0
Pixel 0,1	pixel 1,1	pixel 2,1	pixel 3,1				pixel 1278,1	pixel 1279,1
Pixel 0,1023	pixel 1,1023	pixel 2,1023	pixel 3,1023				pixel 1278,1023	pixel 1279,1023

3-4. Signal Timing Wave Form





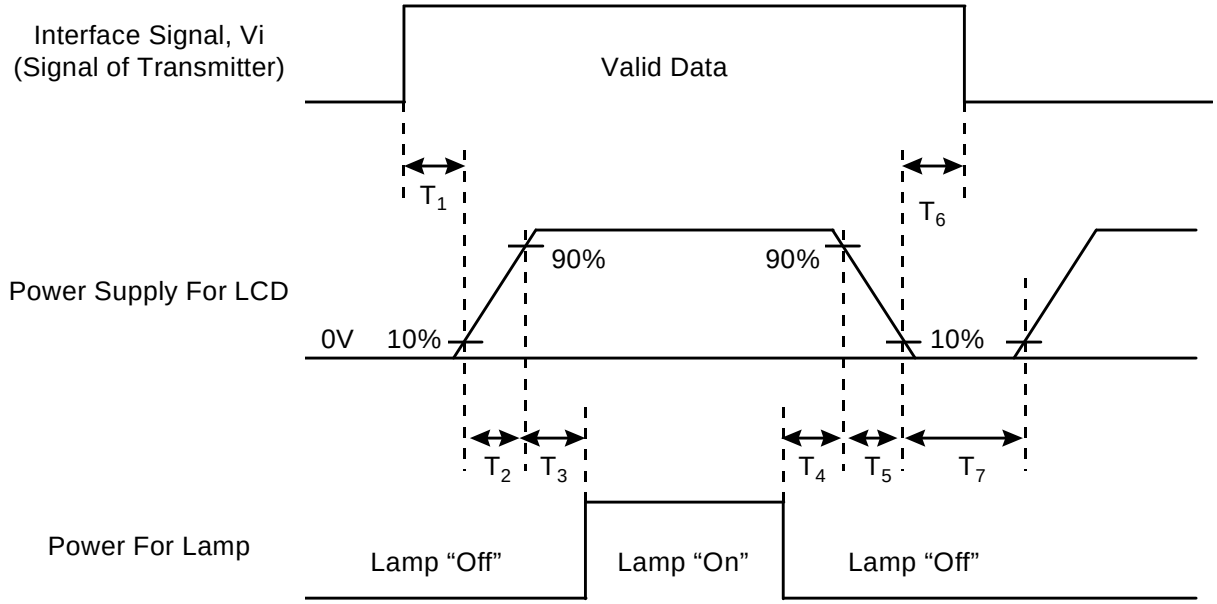
3-5. Color Input Data Reference

The brightness of each primary color(red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 7. COLOR DATA REFERENCE

Color		Input Color Data																							
		Red (MSB → LSB)								Green (MSB → LSB)								Blue (MSB → LSB)							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) Bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(000)Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

3-6. Power Sequences



Parameter	Values			Units
	Min.	Typ.	Max.	
T_1	50	-	300	ms
T_2	0.01	-	20	ms
T_3	100	-	-	ms
T_4	0.01	-	-	ms
T_5	0.01	-	-	ms
T_6	0.01	-	300	ms
T_7	1	-	-	s

Notes: 1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply for LCD V_{CC} to 0V. Invalid input with IV_{AA} for a long time, cause permanent damage to LCD panel.
3. Lamp power must be turn on after power supply for LCD and interface signal are valid.

4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0°.
Appendix A -1 presents additional information concerning the measurement equipment and method..

Table 8. OPTICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	200	300	-		1
Surface Luminance, white	L_{WH}	170	200	-	cd/m^2	2
Luminance Variation	δ_{WHITE}	-	1.15	1.30		3
Response Time	Tr					4
Rise Time	Tr_R	-	20	50	msec	
Decay Time	Tr_D	-	30	50		
CIE Color Coordinates						
Red	x_R	0.581	0.611	0.641		
	y_R	0.299	0.329	0.359		
Green	x_G	0.282	0.312	0.342		
	y_G	0.529	0.559	0.589		
Blue	x_B	0.118	0.148	0.178		
	y_B	0.101	0.131	0.161		
White	x_W	0.290	0.320	0.350		
	y_W	0.306	0.336	0.366		
Viewing Angle						
x axis, right (Φ = 0°)	θ x	+60	+80	–	Degree	5
x axis, left (Φ = 180°)	θ x	−60	−80	–		
y axis, up (Φ = 90°)	θ y	+60	+80	–		
y axis, down (Φ = 270°)	θ y	−60	−80	–		
Cross Talk	–	–	–	4	%	6
Gamma Value(reference value)			2.7			7

Notes 1. Contrast Ratio (CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 50cm from the surface with all pixels displaying white under the condition of I_{BL} = 8.0 mArms. For more information see Appendix A - 2.

3. The variation in surface Luminance, δ_{WHITE} is determined by measuring L_{ON} at each test position 1 through 5, and then dividing the maximum L_{ON} of 5 points luminance by minimum L_{ON} of 5 points luminance. For more information see Appendix A - 2.

$$\delta_{WHITE} = \text{Maximum } (L_{ON1}, L_{ON2}, ...L_{ON5}) \div \text{Minimum } (L_{ON1}, L_{ON2}, ...L_{ON5})$$

4. Response time is the time required for the display to transition from black to white (Rise Time, Tr_R) and from white to black (Decay Time, Tr_D). For additional information see Appendix A - 3.

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Appendix A - 4

6. Cross talk shall be measured at the V and H position.(Window size : 256 x 204 pixels)
For more information see Appendix A – 5

$$\text{Crosstalk Ratio} = \frac{\text{Luminance at Pattern A - Luminance at pattern B}}{\text{Luminance at pattern B}} \times 100(\%)$$

7. Gray scale specification is as following.

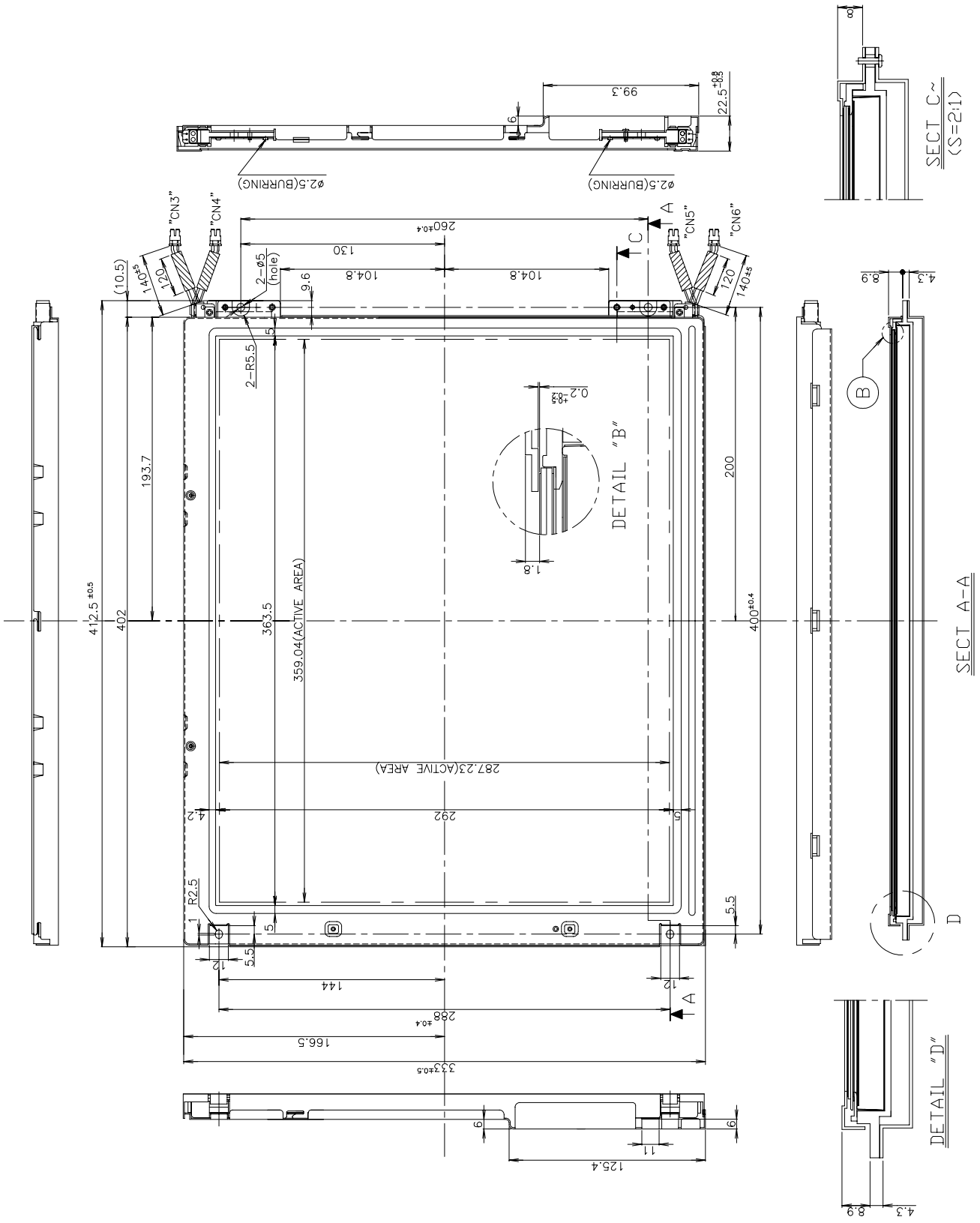
Gray Level	Luminance (%)(typ)
L0	0.25
L31	0.45
L63	2.20
L95	7.20
L127	15.3
L159	27.2
L191	46.0
L223	68.0
L255	100

5. Mechanical Characteristics

The chart below provides general mechanical characteristics for the model LM181E1-J3MN LCD. In addition, the figure below is a detailed mechanical drawing of the LCD. Note that dimensions are given for reference purposes only.

Parameters	Value	unit	Notes
Outside dimensions Horizontal Vertical Depth	 412.5 333.0 22.5	mm	-
Bezel area Horizontal Vertical	 363.5 292.0	mm	-
Active Display area Horizontal Vertical	 359.040 287.232	mm	-
Weight	2835(max)	gram	-
Surface Treatment	Hard coating 3H. Anti-glare treatment of the front polarizer	-	-

< FRONT VIEW >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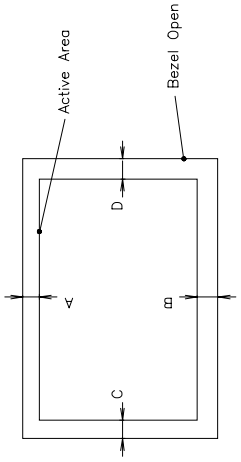
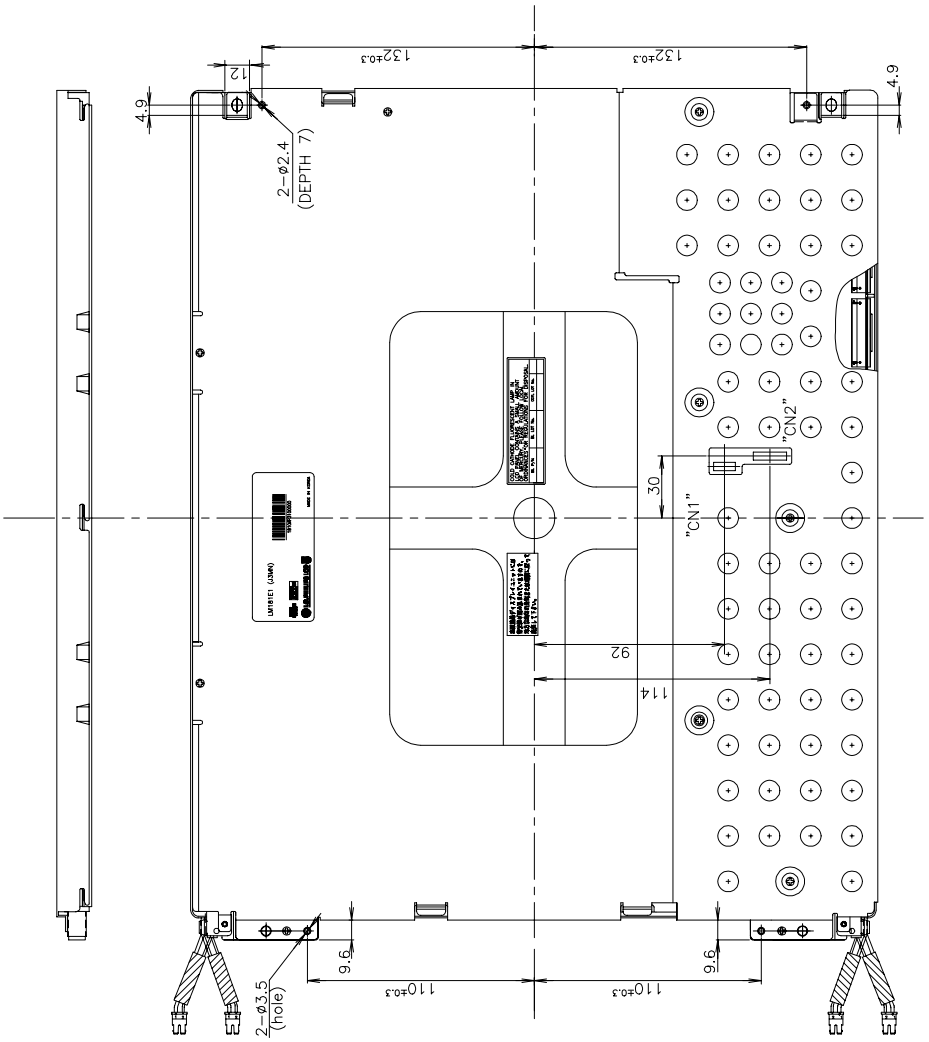
"CN4"
"CN5"
"CN6"
(10.5)
140±5
120
2-ø5 (hole)
9.6
2-R5.5
260±0.4
130
104.8
104.8
99.3
22.5±0.8
ø2.5(BURRING)
ø2.5(BURRING)
DETAIL "B"
0.2±0.05
1.8
193.7
200
412.5±0.5
402
363.5
359.04(ACTIVE AREA)
400±0.4
287.23(ACTIVE AREA)
292
R2.5
5.5
12
144
288±0.4
166.5
333±0.5
125.4
11
SECT A-A
SECT C~
(S=2:1)
DETAIL "D"
8.9
4.3

< REAR VIEW >

NOTE
1. UNSPECIFIED DIMENSIONAL TOLERANCES ARE±0.5 mm
2. THIS DRAWING IS THE ONLY PRELIMINARY AND COULD BE CHANGED WITHOUT PREVIOUS NOTICE.
3. CONNECTOR TYPE
   CN1: JST 5B-ZR-SM3-TF
   CN2: JAE FI-TWE21PB-VF
   CN3~6: JST BHSR-02VS-1
4. Gap between Top case and Glass is 0.2 (+0.5/-0.2)
5. Tilt and a partial disposition tolerance of display area are as follow
   1) Y-Direction : |A-B| ≦ 1.0mm
   2) X-Direction : |C-D| ≦ 1.0mm





6. Reliability

- Environment test condition

No.	Test ITEM	Conditions
1	High temperature storage test	Ta = 60℃ 240h
2	Low temperature storage test	Ta = -20℃ 240h
3	High temperature operation test	Ta = 50℃ 50%RH 240h
4	Low temperature operation test	Ta = 0℃ 240h
5	Humidity Condition operation	20%RH ~ 95%RH
6	Humidity Condition storage	5%RH ~ 95%RH
7	Vibration test (non-operating)	1. Sinusoidal Vibration 1.0 G zero to peak. 10 to 500 Hz, 0.5 oct / min sweep rate. 10 to 500, 10 Hz, one sweep along each axis. 2. Random Vibration 0.002 G^2/Hz, 10 to 500 Hz, nominal 1 GRMS. One hour for each of the three axes.
8	Shock test (non-operating)	1. Half Sine Wave Shock: 120G peak, half sine pulse, 2ms pulse duration. Testing shall consist of one shock in each direction in each axis, for a total of 6 shock inputs.(1 time) 2. Square Wave Shock 30G peak acceleration, 180 inches/sec velocity change. There shall be one shock in each direction in each axis, for a total of 6 shock inputs.(1 time)
9	Altitude storage/shipment	0 - 40,000 feet
10	ESD test (Non-operation)	Condition : 150pF 330Ω Terminal : 200V Chassis : 10kV

{Result Evaluation Criteria}
There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

7. International Standards

7-1. Safety

a) UL 1950 Third Edition, Underwriters Laboratories, Inc. Jan. 28, 1995.
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.

b) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995.
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.

c) EN 60950 : 1992 + A1 : 1993 + A2 : 1993 + A3 : 1995 + A4 : 1997 + A11 : 1997
IEC 950 : 1991 + A1 : 1992 + A2 : 1993 + A3 : 1995 + A4 : 1996
European Committee for Electrotechnical Standardization (CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7-2. EMC

a) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.” American National Standards Institute(ANSI),1992.

b) C.I.S.P.R “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.” International Special Committee on Radio Interference (standards apply by CISPR22 callss B)

c) EN 55022 “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.” European Committee for Electrotechnical Standardization (CENELEC),1988

8. Packaging

8-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A, B ,C : SIZE
D : YEAR
E : MONTH
F,G : PANEL CODE
H : ASSEMBLY CODE
I,J,K,L,M : SERIAL NO.

Note : 1. YEAR

YEAR	97	98	99	2000	2001	2002	2003	2004	2005	2006	2007
Mark	7	8	9	0	1	2	3	4	5	6	7

2. MONTH

MONTH	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one box : 5 pcs

b) Box Size : 524mm× 301mm× 444mm

9.PRECAUTIONS

Please pay attention to the followings when you use this TFT/LCD module.

9.1 MOUNTING PRECAUTIONS

(1) You must mount a module user holes arranged in four corners.
(2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface with a transparent protective plate in order to protect the polarizer LC cell. Transparent protective plate should have sufficient strength in order to resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizer with glass, tweezers or anything harder than HB pencil head And Please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaked with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizer. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9.2 OPERATING PRECAUTIONS

(1) The spike noise causes the malfunction of circuits. It should be lower than following voltage :
$V = \pm 200mV$ (Over and under shoot voltage).
(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) A module has high frequency circuit. If you need to shield the electromagnetic noise, please do co-work together.

9.3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits. It is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch I/F pin directly.

9.4 PRECAUTION FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9.5 STORAGE

When storing modules as spares for a long time. The following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9.6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion- blown equipment or in such a condition, etc.

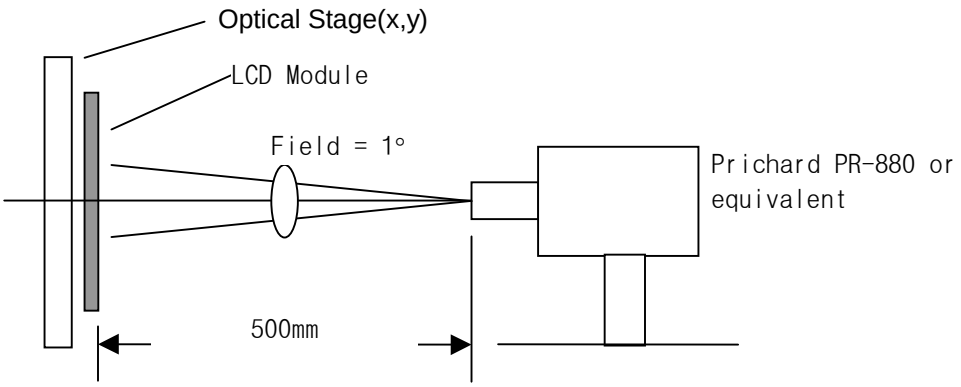
(2) The protection film is attached to the polarizer with a small amount of adhesive tape. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the adhesive tape is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of adhesive tape still on the polarizer after the protection film is peeled off.

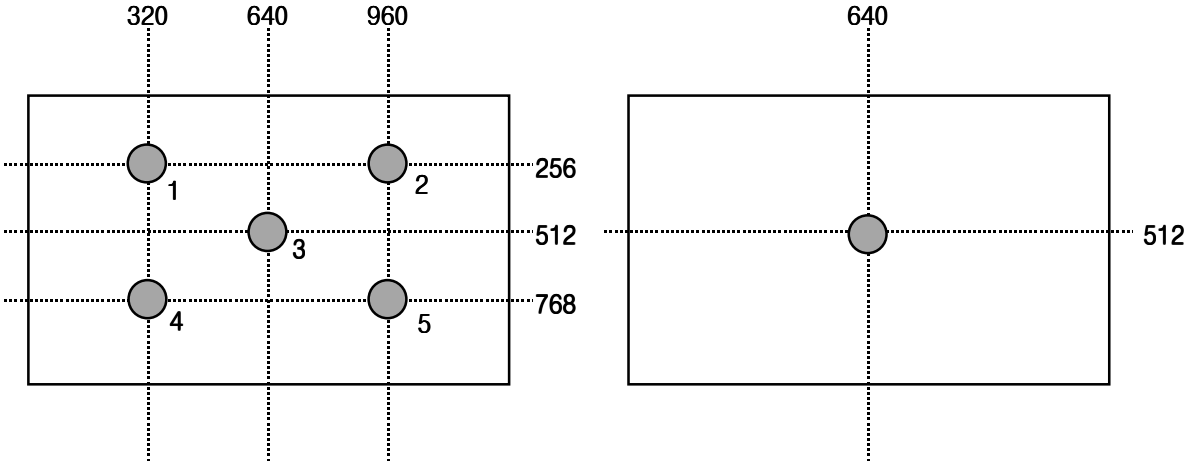
(4) You can remove the adhesive easily. When the adhesive remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal- hexane.

APPENDIX

A-1 Optical Characteristic Measurement Equipment and Method



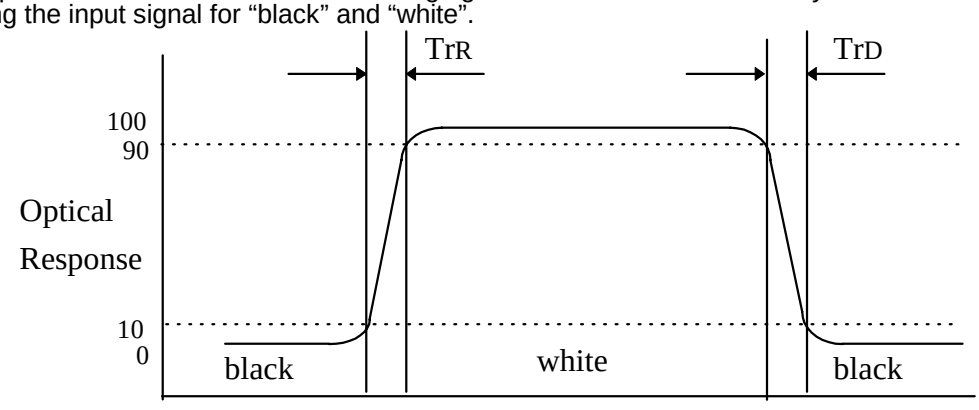
A-2 Luminance Measurement



<measuring point for luminance variation> <measuring point for surface luminance >

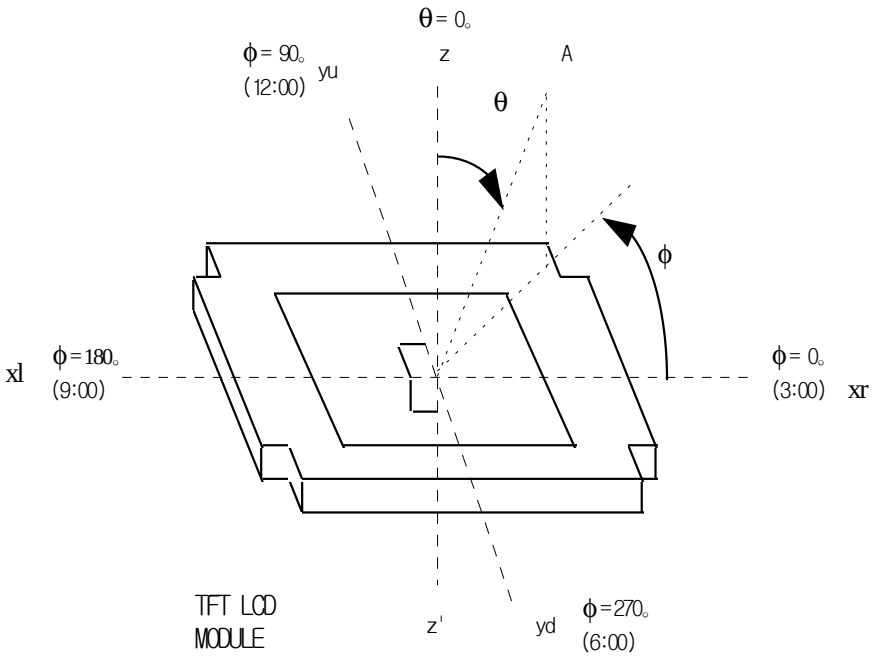
A-3 Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

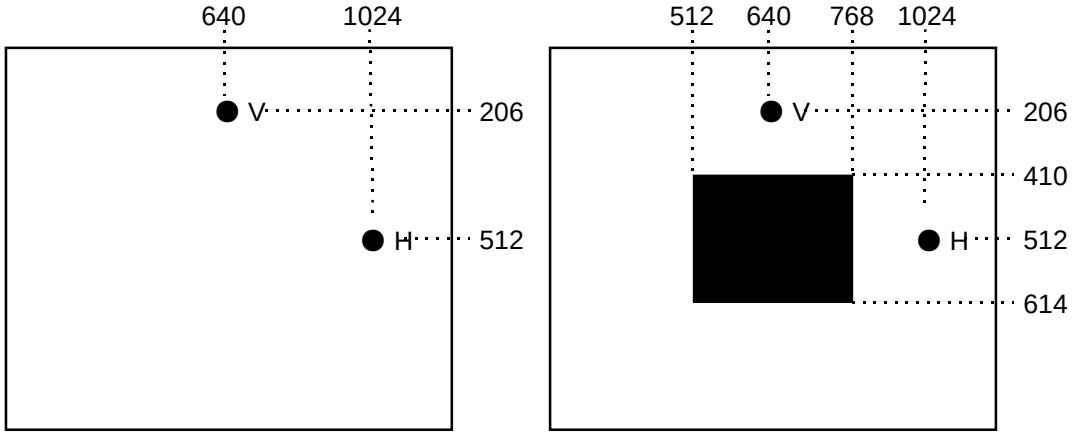


A-4 Viewing angle

<Definition of viewing angle range>



A-5 Cross Talk



(Background : white)
Pattern A

(Background : white, Window: black)
Pattern B